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Practical Irrigation
for Alberta

By

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Practical Irrigation for Alberta.

Suggestions contained in this booklet on irrigation have been compiled from actual experiences of those who have made a close study of this method of farming in Alberta, and are published with the view of passing on the benefit of this experience to those who are about to take up irrigation farming in this province.

Irrigation is the scientific application of water to the soil to stabilize and to increase production. The principle of conservation of moisture applies with equal force in irrigation farming and in dry farming. In each case the moisture available must be conserved and so used as to provide the largest returns from the crop produced. The obvious advantage in irrigation is that the water is made readily available, and with its proper application to the soil, production can be rendered much more certain, even though the rainfall may be very light during the growing season. The water provided by irrigation thus becomes a very valuable asset, and as such, it should be used to the very best advantage. There should be no waste, either by permitting the water to run off the surface, or by over-irrigation. In order to prevent such losses, care must be given to the preparation of the land.

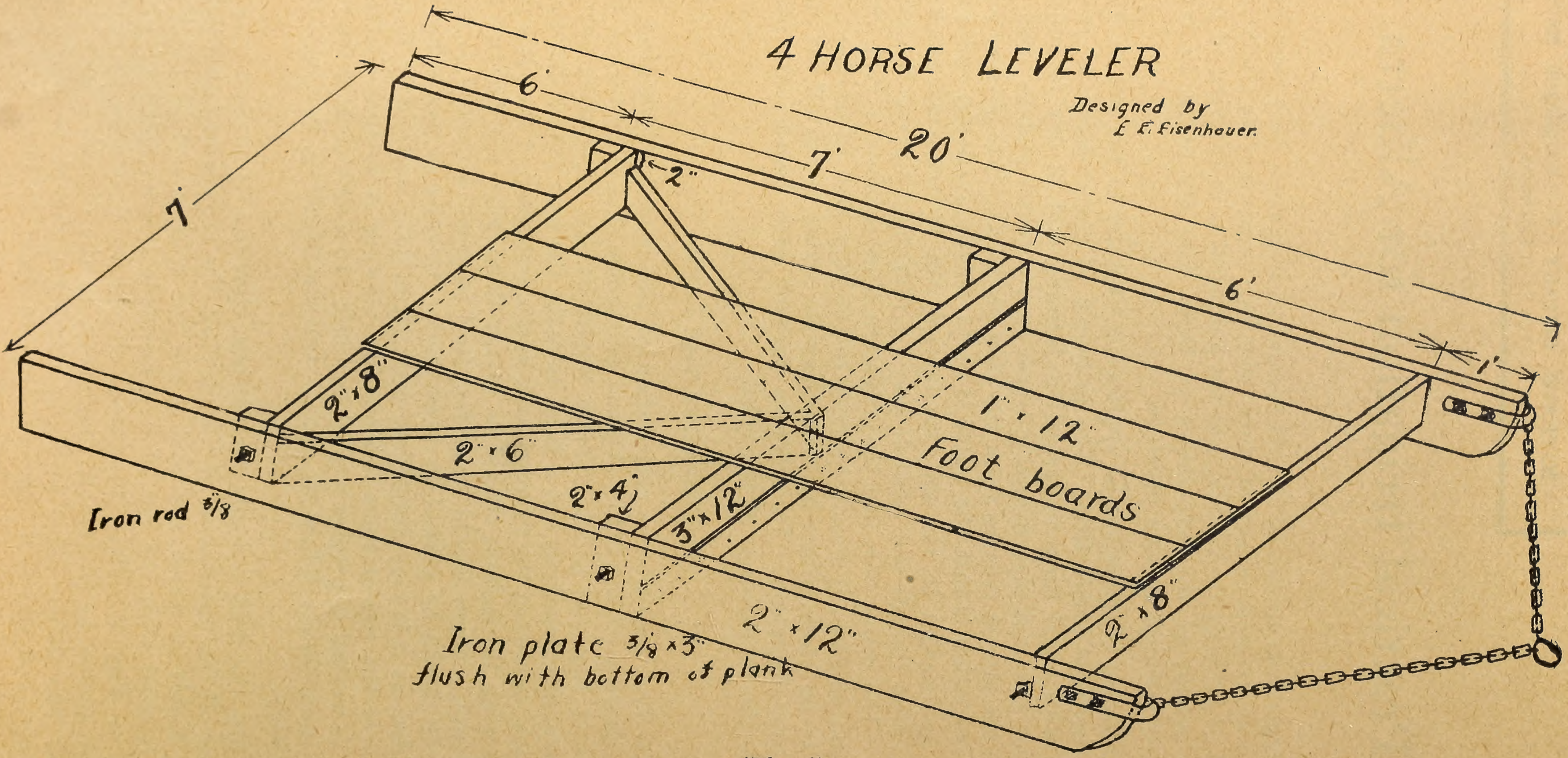
Preparing the Land.

The first requisite in preparation of the land for irrigation, is the proper plowing of the field. All sod or stubble should be turned under; no part of the land should remain unplowed. To accomplish this, it is necessary, when striking out a field, to make the first round shallow, then plow back, throwing the furrows back again, but sending the plow deeper. The plowing throughout should be evenly done, with the furrows all the same depth. There should be as few dead furrows or crowns as possible. The field should be plowed in wide lands. Crowns in particular are to be avoided, as it is very difficult to work them down sufficiently to get the water over the top of them. When the plowing is completed, the field should be worked to prepare a good seed bed. In a stubble field the harrow should immediately follow the plow. On new breaking, thorough discing is necessary.

When the field is ready for discing, time can be profitably spent in levelling off the unevenness of the plowing, the crowns and the dead furrows. Fields in which the land is not too rolling, can be quickly and easily levelled with the use of a home-made leveller, plan of which is shown in Fig. 1. This implement should be drawn across the field at right angles, or preferably diagonally, to the direction in which the plowing was done. This levelling operation should be performed at least once, and twice, if there is time, in order to lessen the difficulty

4 HORSE LEVELER

Designed by
E. E. Eisenhauer.



(Fig. 1)

encountered in irrigating. The class of crop to be raised often determines the amount of time which should be spent in levelling. If the crop is to be grass or alfalfa for pasture or hay, as much time as possible should be spent in levelling, since the field will be in sod for a number of years before being plowed again. Under such conditions, it is advisable, whereever possible, to remove any small knolls and fill up some of the low places. In any case, where grass or hay crops are grown, the field should be thoroughly levelled.

In the case of grain crops the leveller should be drawn over the field at least once, and oftener if possible. The leveller cannot be used if the field is the least bit wet. When the levelling is being done, opportunity should be taken to remove any stones that may be found on the surface.

Immediately the levelling is completed, the seeding should be done, as the levelling leaves the field more liable to soil drifting. The seeding should be done in the direction of the fall of the land, to facilitate irrigation.

MAKING DITCH WITH THREE-WHEEL DITCHER.

As the irrigating proceeds from year to year, more time should be spent in levelling. Places found difficult to irrigate one year should be staked out and levelled off the next year. When the farmer has had several crops and has gained some experience in irrigating, he will be able to spend some time and money in levelling off his fields, and rendering them more adaptable to easy irrigation.

Location of Ditches.

Location of ditches is too often left until the crop is actually suffering from lack of moisture. Such delay only results in failure to bring water to many acres of crop in sufficient time to aid production. After the land is levelled and the crop seeded, immediate preparations should be made to locate the ditches. The first principle to be observed in locating ditches is that the water must reach the farm as directly as possible and in sufficient quantities to permit of proper irrigation. The ordinary irrigating head of water (that is, the quantity of water received for irrigating) should not be less than from two and one-half to three second feet (that is, two and one-half to three cubic feet of water passing a given point every second) if the irrigator is to make economical use of the water. The ditches should be made large enough to carry at least this amount of water, and double this amount, if possible, so that, if the water is available, it can be used, if necessary.

In order to have fields that are easy to work, it is an advantage to have the ditches straight, but this is not always possible. This is particularly true in Southern Alberta, where, in the system of irrigation that has been followed, advantage has been taken of the natural slope of the land, with very little work done in the way of levelling. Hence it is found that most of the ditches on the irrigation farms of Southern Alberta are crooked. Ditches that follow the contour of the land with a fall of two to two and one-half inches in every hundred feet are very conducive to the economical use of water. By having such ditches it is possible to catch the waste water from an upper ditch for use in a lower one, thus preventing waste of water by run-off. The use of contour ditches often makes it possible to bring the water to the tops of small knolls without using fills, whereas with straight ditches it is necessary to make fills. The important thing is to construct the ditches in such a manner as to bring the water to the high places in the field and assure these spots irrigation. Once the high places are watered it is comparatively simple to water the lower places. The ditches should be so placed that the whole irrigating head can be taken to any part of the field. It is a waste of time and of water to use a single plow furrow to lead water to the top of a small knoll.

The ditches should be large and strong. The banks should be high enough, and wide and strong enough to carry any head of water without breaking. It is from the banks that the irrigating is done, and high banks facilitate easy irrigation. Where it is necessary to put in a fill where the grade line of the ditch is a foot and one-half to two feet above the surrounding land, a scraper may be used to pile up the earth, the ditch being carried along the top of the pile. The fill should be wide and strong and should not be run on a grade or fall of less than one inch in one hundred feet if avoidable. The sides of the fill should be seeded to grass, such as Kentucky Blue or Brome, otherwise they soon become a seed bed for weeds. Where a greater depth of fill than two feet is necessary, it may be cheaper to build a wooden flume or instal a metal one. This takes up less land, is less trouble when installed, does not require the repairing that an earth fill does, and there is less danger of its washing out.

Where a field lateral is taken out of the main or supply ditch on the farm, the outlet should be at right angles to the main ditch, since with sharp angles there is waste land.

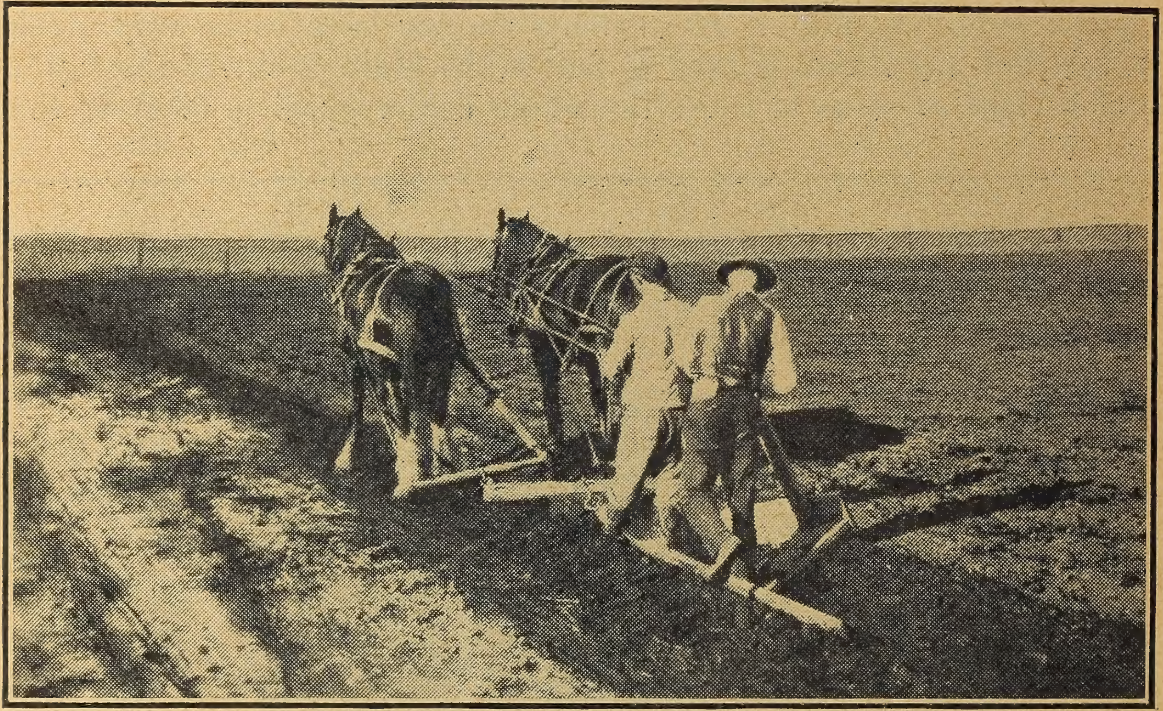
In fields of grass or alfalfa, the ditches, wherever possible, should be made straight, as this facilitates cutting and other operations connected with the handling of the crop. However, ease of irrigation, and ability to cover the whole field with water must always be the first consideration, and these principles should never be sacrificed, even though it may mean putting in crooked ditches. The first year the field is seeded the ditches should be from 150 to 200 feet apart, depending on the slope of the land, the irrigating head available, and the type of soil. If the land is very sandy it may not be possible to put them this far apart, but on the whole the distance quoted has proved very satisfactory on irrigated land in Southern Alberta, where the free flood method of irrigation is used. Where the land falls away evenly in two directions it is very difficult to give a hard and fast rule as to the best direction in which to run the ditches, but, as mentioned before, the contour system is very satisfactory.

In grain fields ditches are staked out and sometimes plowed before the grain gets very high. The ditches do not have to be very straight here, for they are always plowed in before the grain is cut in the fall, and should be located so as to cover the whole field regardless of their shape. They should be strong, and, as the earth is newly turned up just at the time of irrigating, and has had no chance to settle, the banks should be built well above the surface of the water that is carried in them. The ditches should be from 150 to 200 feet apart, or a ditch every fifty paces.

DITCH THROUGH AN OAT FIELD.

The amount of work necessary in making a ditch depends largely on the type of ditching machine used. If a road grader is available, it is possible to put in the ditch immediately after it is staked out, without any preliminary work in the way of plowing. Where the ordinary ditching machine is used it may be necessary to plow once, while if the ditches are made with an "A" Crowder, more plowing will be required and must be done if a satisfactory ditch is to be made.

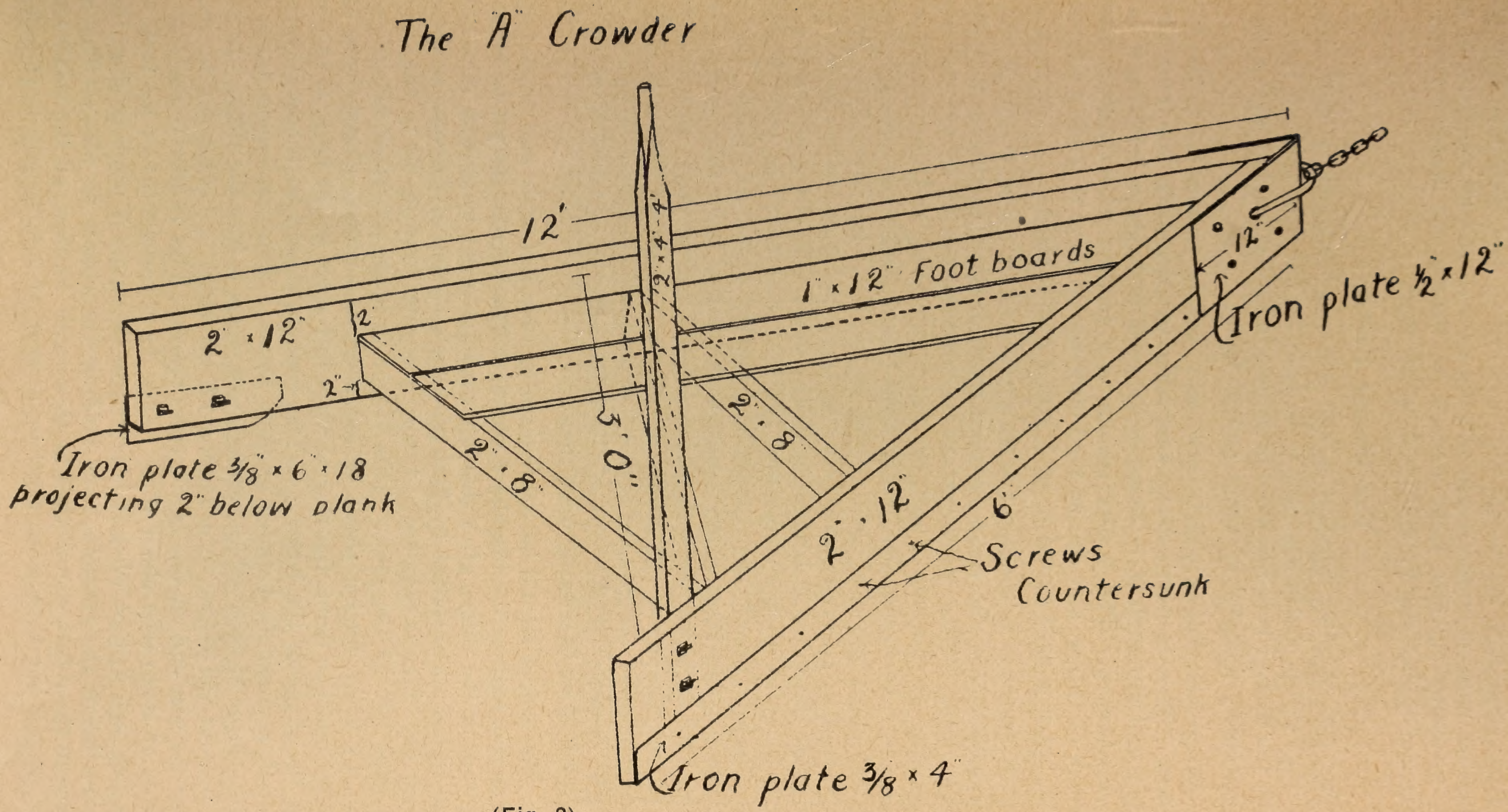
In making the ditches, a plow should first be used, making one round, throwing one furrow out, and then coming back in the same place and making the furrow a little deeper. Then two rounds should be made with the ditcher, holding it so that the ditch is made in the form of a V, with about a 45-degree angle at the base. If two rounds do not make a satisfactory ditch, another round should be made. Where a ditching machine is not available, the ditches can be made with a plow and an "A" crowder (see Fig. 2). Where the crowder is used, one round with the plow should be made, leaving about a six-inch core between the two furrows. Then another round should be made, forcing the plow down in the center of the furrow. Then a round should be made with the crowder, cleaning out the dirt. By making another round with the plow, nosing it down in the ditch, lengthening the hitch by means of a chain and then making two or three rounds with the crowder, a very satisfactory ditch can be made.



MAKING DITCH WITH THE "A" CROWDER.

The ditches should at all times be kept clean and free from weed growth and grass. In grain fields it is necessary to make new ditches each year, but after the ditches have once been put in, it is a very simple matter to locate them again. The outline of the old ditch can be seen by the mark of the low places in the field, or it may be indicated by a little stronger growth of grain, as the ditch bed is really a summerfallow, and the grain along its edges grows more rank. As ditches are comparatively easy to make, it is a much more satisfactory plan to plow them in each fall, and to reconstruct them again in the spring, rather than to attempt to clean out the old ditches that have become filled up with grass and weeds.

In addition to the ditches that bring the water to the farm, the different fields, and those that are used to spread the water over the land, there is one more to be constructed, and that is the waste ditch. This ditch should be located so as to keep the water off the public highway or the neighbor's farm. Its object is to carry away any water that runs off the surface of the field, and which usually collects in the low places on the farm, either to a reservoir or pond, or back into the canal. It must always


The "A" Crowder
12'
2" x 12"
2"
2"
1" x 12" Foot boards
2" x 4"
3' 0"
2" . 8"
2" . 8"
12"
Iron plate ½" x 12"
2" . 12"
6"
Screws
Countersunk
Iron plate 3/8" x 6" x 18
projecting 2" below plank
Iron plate 3/8 x 4"

(Fig. 2)

be large enough to handle all the waste water, and should be kept clean. Wherever it must cross a road, extreme care should be exercised to make the necessary culverts large enough to handle the water without the danger of its backing up and flooding the road.

THE BORDER SYSTEM.

The free flooding method is the one most commonly used and the one that will probably continue to be used for the first three or four years until the farmer becomes more proficient in irrigation, but such a method is extremely wasteful of water and of labor.

A system that is widely used and that is economical is the border system. This is particularly adaptable to irrigating hay and pasture crops, and although it is occasionally used with grain farming it is not so satisfactory. The border system is a method of irrigating between borders or ridges, and can be used even where there is quite a fall to the land, but it is most suited to land with a gentle slope.

The borders or ridges of earth are placed in the direction of the fall of the land, and the space between them or at right angles to them, is almost level. These ridges should be placed from 25 to 100 feet apart, depending on the type of soil, the fall of the land, and the head of water available. At Lethbridge it has been found that where the ridges were 40 feet apart the best results were obtained. The water flows between the ridges in an even sheet over the whole field, and when one space is irrigated the water is turned on to the next. The water is brought from ditches put in on the contour of the land and about at right angles to the ridges. These ditches should be from 400 to 600 feet apart. The ideal way to irrigate these places between the ridges is to turn the water on them long enough to soak them thoroughly, and yet have no waste water. If too much water is put on, the surplus can be turned into a ditch lower down and used on another border. Where this system is used, the crop can be seeded over the tops of the ridges, as they do not interfere with the seeding or harvesting operations.

The ridges should be about three or four feet wide and from four to six inches high, after they have settled. The harrow should be run over the tops of the ridges after they are made in order to smooth them down. The ridges are installed by first plowing a couple of furrows at the spot where the ridge is required. A ridger is then used to fill in the holes at the side left by the plow. This ridger is made by using two pieces of 2-in. by 12-in. lumber about 18 feet long, as runners, placed from 12 to 15 feet apart in front, tapering to three feet apart at the back, thus assuming the shape of the letter A. The runners should be thoroughly cross-braced, and can be handled by four horses. This implement takes just a thin layer of earth off the surface and drags it into the ridge. In order to prevent the ridger from sliding off the ridge, a rudder can be placed near the rear end, on one of the cross braces. This rudder is made of two pieces of strap iron about three inches by three-eighths of an inch, and long enough so that when it is bolted to the brace it projects about three inches below the runners, thus holding the ridger in place. The land between the ridges should then be thoroughly levelled, all the small knolls cut off and the depressions filled in, so that, at right angles to the ridges, the land is all level. All the irrigator has to do is to turn the water in at the upper end of the border and allow it to run until the field is irrigated.

THE FURROW METHOD.

The furrow method of irrigation is not generally used in Alberta save for the irrigating of hoed and cultivated crops. The furrows are placed between the rows of crop, which in the case of potatoes, corn or sunflowers, are from two and one-half to three feet apart. The rows should be straight and planted in the direction of the slope of the land, so there must be no high places in the rows. The water is turned down each furrow until it reaches the end. In this system, the delivery ditches do not have to be closer than 400 feet, depending on the kind of soil and the fall of the land. A very open soil requires the ditches to be closer together in order to prevent over-irrigation. Such a system is very economical in the use of water, and is the one method where a small head of water can be used to advantage. It prevents the baking of the surface, as only a small area is actually flooded, and at the same time there is much less surface evaporation of the water, than in the case of flood irrigation. By cultivating immediately after irrigating, or as soon as it is possible to get on the field, the moisture is nearly all conserved and there is less danger from the rise of alkali than where flooding is resorted to.

FIELD OF CORN (on the left)
SUNFLOWERS IRRIGATED BY FURROW METHOD (on the right)

THE TIME TO IRRIGATE.

It is very difficult to state the exact time at which any crop should be irrigated, without actually seeing the land. The condition advisable to maintain is that in which enough moisture is kept in the soil to keep the plant growing at the maximum rate continuously. Unfortunately, our general system of irrigation is not arranged for such an ideal method, and it becomes necessary to put water on the land in fairly large amounts at different times in the season. Under such conditions effort should be made to put on such amounts as will keep the plant growing so that at no time during its development does it suffer for water. Another thing that should be borne in mind is that too much water should not be put on at any one time. If this is done a surplus of water is left in the soil that will cause a rise of the water table, unless there is excellent underdrainage. In certain districts it also causes the more rapid rise of alkali. After a field has once been well watered it is not necessary to put on more than four inches of water to soak the first four feet of soil. Most crops take moisture only from that depth, and any greater amount of water put on the soil is wasted. The whole idea should be to put on light irrigations often enough to keep the plant growing all the time.

Over-irrigation is one of the worst forms of water waste. In over-irrigation water is used unnecessarily that might well be applied on a dry farm. To overcome the possibility of over-irrigation, the ditches should be placed in the manner that has been outlined, and wherever possible *a large head of water should be used so as to get over the land rapidly.* It is much better to put on light, rapid irrigation and do this frequently than to put on one heavy irrigation.

The irrigating should be done at the time when it is most needed and when it will do the most good. No hard and fast rule can be given as to the exact time to irrigate. However, the life history of the plant gives a fair indication as to the best time to apply water, and as to when it is being used most rapidly. During the germination period very little moisture is being used, but the amount needed keeps increasing through stooling and at the time of flowering the greatest amount is being used. Water is used at this time not only in the growth of the plant, but also in the large amount of transpiration which takes place from the leaves. In addition, about this time, the very warmest weather arrives, and consequently there is greater evaporation from the surface of the soil. As a result of all this, more water is needed. When the grain has filled and is ripening very little moisture is required.

It is believed by some that the color of the plant can be used as a good indication of the need of water, but this is not a safe rule. A much better and surer plan of ascertaining when water is needed is to take a shovel and dig down in the soil to the full depth of the blade. Take a handful of soil from this opening and squeeze it. If it remains in the form of a ball there is sufficient moisture present to last for some time, but if it falls apart then irrigating should be started immediately.

The question of spring, summer and fall irrigation is a very important one, and each has its place. The crops should be so arranged, and such a rotation practised, that water can be used profitably all through the season. Fall irrigation is specially beneficial, and lengthens the irrigating season. At that time of the year it is often possible to obtain a larger head of water, as fewer people are irrigating. Fall irrigation also germinates weed seeds and volunteer grain that may be on the field, in addition to storing moisture in the soil for use of the crop in the spring, thus delaying the time when it becomes necessary to irrigate in the new season. Moisture is thus made available for germination of the seed in the spring. In the case of alfalfa, it is possible by fall irrigation to harvest the first crop without irrigating. In certain districts where there is an exceedingly heavy soil or clay layer near the surface, or in districts where the season is short and which are subject to early spring frosts, it may not be advisable to fall irrigate alfalfa. However, in Southern Alberta, no ill effects have ever been observed from fall irrigation of this crop. The excellent under-drainage in this region also carries off the surface water that may result from fall irrigation.

The main drawback to fall irrigation is that it is very difficult to get the crop off the land in time to do very much irrigating. At this time of the year, too, labor generally is higher in price than during the regular season. Weeds are apt to be blowing about in the fall, causing considerable trouble by blocking up ditches. Sometimes fall irrigation prevents fall plowing, although quite often the land is plowed first and irrigated afterwards. This practice is not objectionable, but it is more difficult to spread the water evenly and put on a light irrigation on newly plowed land. In fall irrigation, the opinion is that some surface cultivation should be done after irrigation. Notwithstanding the objections mentioned, fall irrigation has been a most successful practice in Southern Alberta. This is particularly true in the case of grasses and alfalfa.

Irrigation during the summer should be done only when the plants are in need of moisture, and then frequent light applications should be given. Water put on the crop when there is already sufficient moisture in the soil, or put on too heavily, is likely to cause a check in the growth of the plant, which may result in smaller crops, uneven ripening of the grain and a poorer grade.

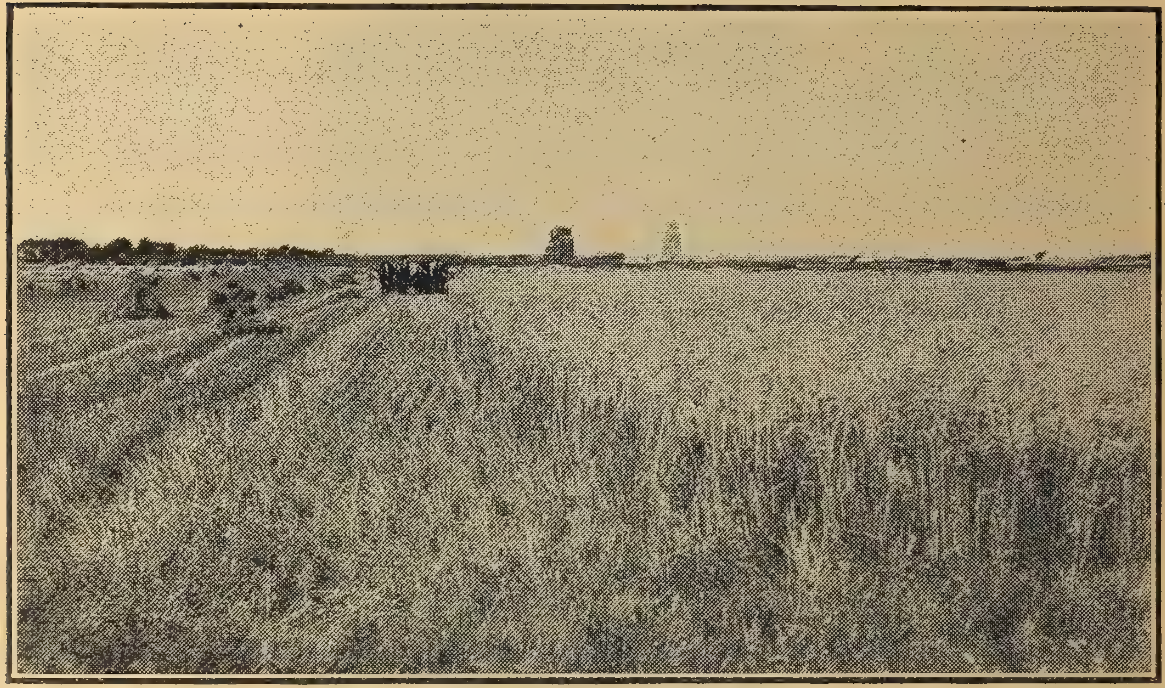
IRRIGATING WHEAT, OATS AND BARLEY.

These cereals take water only from the first four feet of soil, but to obtain heavy yields and a good grade of grain, it is necessary to keep their needs well supplied. There is usually moisture enough in the soil in the spring to germinate the seed and as far as possible, it is advisable to get the crop started without irrigating. If there is not enough moisture present to germinate the crop, then it should be hastened by irrigation, but this is rarely done. This practice is preferable, however, to irrigating the land in the spring before seeding. If this is done, it makes the seeding rather late, with the consequent danger of damage from frost in the fall. Early application of water is also apt to cause a slight delay in the growth of the plant, particularly if the under-drainage is not very good. If the practice of fall irrigating is followed, there is no danger of the seed needing water to germinate in the spring.

The first irrigation in the spring should be given after stooling has been completed. This point cannot be stressed too much, and wherever possible no water should be applied before this time. From this time on the plant must never be checked in its growth. This is particularly true in the case of oats, for if their growth is stopped and they begin to ripen, then water is turned on, there will doubtless be a second growth, which causes uneven ripening and gives a poor yield of low grade grain.

Rapid irrigations of from four to six inches are the most satisfactory and the irrigator should always try to keep the applications down as near as possible to this amount. Irrigation is not complete unless the soil is soaked down to the full depth of the shovel, and before turning the water off, the irrigator should be certain that the soil is soaked to that extent.

When the irrigating is done before the grain fully covers the ground, there is apt to be considerable evaporation and baking of the soil. Both of these things cause considerable loss of moisture, and in certain soils it is advisable to give the growing grain a light cultivation when the surface has dried off sufficiently to do so. This cultivation can be done by using a light harrow, with the teeth sloped back so as not to tear out any of the plants. The benefit of such work is that it allows the air to get into the soil and gives the crop an opportunity to recover more quickly from the slight check that it receives by being irrigated so early in the season.



FIELD OF IRRIGATED BARLEY

Over-irrigation in grain is evidenced by the bright yellow color that is occasionally seen in fields. This leads to uneven ripening and a consequent lowering of the grade. When irrigating grain fields, or in fact any crop, the main thing is to get the water on the higher places and not allow too much water to get on the lower parts of the field.

IRRIGATING ALFALFA.

Alfalfa develops more quickly than any other crop under the proper conditions of temperature, plant food and water. Unless unavoidable, irrigation is not done for the first cutting, but in some seasons, even where fall irrigating has been done, it is necessary to irrigate before the first crop is taken off. If this is done, the water should be applied so that the field will dry off before the crop is ready to cut. Immediately the first crop is taken off, the field should be irrigated. The best amount to apply is about six inches, and not more than eight to ten inches should be put on in any one irrigation. Generally, it is not necessary to irrigate again before making the second cutting. The second crop comes on at a time when there are the highest temperatures, and if there is sufficient water in the soil the growth is very rapid. After taking off the second crop the field is watered, and if a third cutting is made another irrigation may be given on land that is not too heavy and that has good underdrainage. Cases are known where the irrigating was done so late in the fall that the ice formed on the field each morning, but no ill effects were shown on the crop in the following year.

Alfalfa will not stand "wet feet," so care must be exercised to prevent putting too much water on at one time. If the field is over-irrigated, which often happens to the low spots of the field, or where waste water is allowed to run over the surface, yellow spots appear and the growth is much less than in other parts of the field. Of course, if this practice is followed very long, some of the alfalfa is certain to be killed.

MAKING A DITCH BY MEANS OF A MARTIN DITCHER.

Alfalfa is one crop that can be quite satisfactorily used to control the Canada Thistle. If a good stand of alfalfa is obtained in the spring by seeding in the middle of May and cutting the crop before the Canada Thistle has had a chance to form seed, there is little danger of the thistle spreading. Thistles take a great deal of moisture out of the land, so the soil must be kept moist until the first crop is cut if the alfalfa is to have any chance against the weeds. The following years the alfalfa is cut so often that the thistles never have a chance to form seed and become so weakened, that in some cases they are completely killed. In fact, alfalfa can be used to control almost any weed that grows here. In places where dandelion or wild barley get a start in the alfalfa field, it is necessary to plow the field up and seed again. If the stand of alfalfa is not very good, it is possible to reseed the following spring, but it is impossible to thicken up an old alfalfa field by reseeding. On irrigated land, alfalfa should be seeded to the extent of about 15 pounds per acre, and the best practice, it is believed, is to seed without a nurse crop. Instances are known where good results were obtained with a nurse crop, but such methods do not give the alfalfa a fair chance and often mean that the field has to be reseeded the next year. As alfalfa seed is costly and as the field will be in sod for a number of years, it is the opinion that use of a nurse crop is very poor farming.

Where alfalfa and timothy are used together, the first crop is cut much later than if the crop was all alfalfa. The hay obtained from the first cutting is a mixture of both. The second crop is nearly all alfalfa, as the timothy makes very little growth. The first crop may require an extra irrigation before cutting in order to get the best results from the timothy.

Irrigation of Grasses.

In the irrigation of grasses it is well to try to keep a continuous supply of water in the soil. Most of the grasses are very shallow feeders, but, due to their large leaf surface, use a considerable amount of water. Taking timothy as a typical grass under irrigation conditions, it is found that in order to produce anything like a large crop, water should be flowing over the surface all the time. In order to do this, a large head of water is needed and the ditches should be close together so that it is possible to get over the field quickly. As soon as the field has been watered one can almost immediately begin irrigating again. This can be continued until the crop is ready to cut. Following such a practice, large yields have been obtained. Such a procedure, however, is apt to cause over-irrigation, and any land on which timothy is seeded, should have good under-drainage, and the surplus water that runs off the surface must be taken care of.

Pastures.

Pasture is one of the most important parts of the farm and great care should be taken in laying it out and in levelling so that the field will irrigate easily. As more of the country comes under irrigation, mixed farming must of necessity be more widely adopted. This naturally brings up the subject of pasture and pasture mixtures. The pasture should be conveniently located with relation to the buildings of the farm and should always be located so that there is water available for the stock. Ditches through the pasture should be made extremely strong and should be so placed as to cover the whole field easily. This is necessary, as it is often impossible for the irrigator to spend all his time looking after the water on this part of the farm and yet there must not be over-irrigation.

Little is known about pasture mixtures, although considerable work has been done in Southern Alberta and is being done along the line of obtaining a suitable mixture. Regardless of the variety of pasture grasses used, it is known that to obtain the best results it is necessary to water the field often so that the grass never has to suffer for want of water. It is found that under ordinary conditions irrigating every two weeks is satisfactory. The pasture field should be divided into two parts so that one part may be irrigated and allowed to dry while the other part is being pastured. Under no condition should stock be turned on a pasture field while it is still wet from irrigating, for stock can do untold damage to land in that condition by cutting it up with their feet. In dividing the pasture field it is impossible arbitrarily to divide it into two equal parts. The dividing fence should be placed along one of the ditch banks through the pasture field so that water from that ditch can be used to irrigate the field without being damaged or interfered with by the stock.

IRRIGATION OF POTATOES.

Potatoes are one of the most profitable crops under irrigation. It is a crop that responds to careful irrigation and gives greatly increased yields of good quality marketable potatoes. The objection is often raised that under irrigation potatoes are apt to be soggy. While there is some ground for this objection, yet if proper care is given to the handling of the water, it is possible to raise just as mealy potatoes as under dry farming conditions. Soggy potatoes are due to two reasons, one being over-irrigation and the other under-irrigation. The first of these is very apparent, but it is through the second that the greatest damage is often incurred.

FURROW IRRIGATION OF POTATOES.

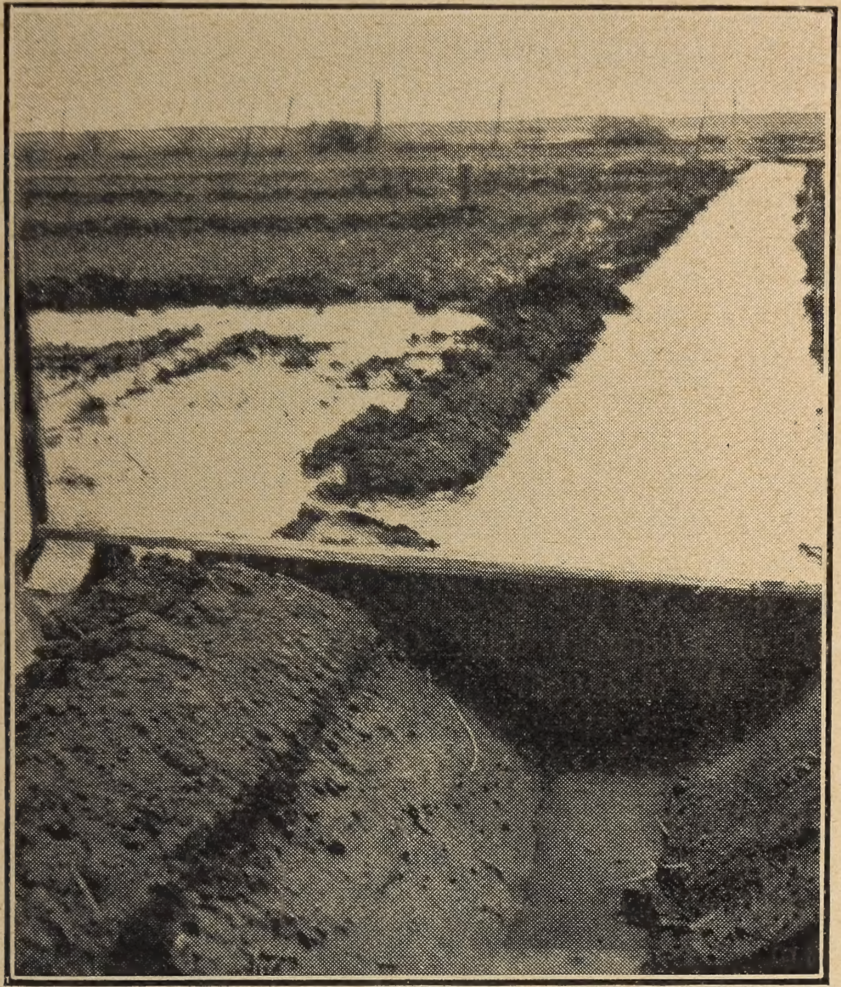
Under-irrigation is brought about by allowing the field to become dried out some time during the growing season until plant growth ceases, and then putting on more water. Growth of potatoes must never be checked during the growing season if the best results are to be obtained. There should always be water enough in the soil to keep the tubers growing at their maximum rate. If the plants at any time in the season are checked in their growth, so that the tubers begin to mature, then no more water should be applied. When more water is put on, a second growth is likely to take place and those potatoes which were beginning to mature will again start growing and the resulting crop will be of poor quality, soggy, and very uneven in size.

It is well, if possible, to have enough moisture in the soil so that the crop can be carried on until it is in bloom before any water is applied. It is occasionally necessary to irrigate in order to start growth, but if such a practice is necessary then the land should be thoroughly cultivated to prevent baking and to lessen evaporation. After the plants are in bloom (which is the time the potatoes have set) they should never have their growth checked. If the crop is in need of water, apply a very light irrigation, not soaking the whole field and under no conditions flooding the crop, that is, letting water get around the stems. Potatoes being a cultivated crop, irrigation should be by the furrow method and if not much water is required, it should be turned down every other furrow for the first irrigation. As soon as the water reaches the end of the furrow, it should be turned out so as to avoid over-irrigation. The rows should be from 200 to 400 feet long depending on the type of soil. They must be straight and so made that the water will run readily to the bottom of the furrow without flooding over the field. After the first irrigation, and in fact every time the water is applied, the field should be thoroughly cultivated as soon as it is possible to use the cultivator. The next irrigation should be given about ten days later, according to the need of the soil for water. This irrigation should thoroughly soak the field and the water should be turned down each row and allowed to remain until the rows are completely wet through. Until the middle of August, water should be applied every ten days according to the need. After this time, no more water should be put on the field, since it requires the balance of the season for the crop to mature. This is an excellent crop to raise on weedy land and takes the place of a summer fallow in getting rid of weeds. If the above practice is followed, it is possible to obtain enormous yields of good quality marketable potatoes.

CROP OF SUNFLOWERS UNDER IRRIGATION

CANVAS DAM.

It is largely the practice to use earth as a check in the irrigating ditch, but this is poor economy. Even though earth is cheap and easily available, yet it is often washed out, cannot be put in when there is a large head of water in the ditch and as earth is usually taken from the side of the ditch the field is soon cut up. A much more satisfactory practice is to use a canvas dam. This is light, can be put in the ditch whether there is water there or not, is easily constructed, quite cheap, and with proper care has a long life. For the ordinary farm ditch, use two pieces of 1-in. by 3-in. lumber eight feet long nailed together with a piece of canvas between them. For convenience in carrying about the field, a handle at one end can be made out of a few feet of baling wire. Immediately after the irrigating is completed, the canvas dam should be allowed to dry and then be rolled up and put away until needed again. In this way the dam will last for years.



CANVAS DAM INSTALLED IN DITCH.

THE SIZE OF THE FARM.

Under irrigation conditions in Southern Alberta, the farm should have from 80 to 100 acres of irrigable land on a quarter section. This is large enough for the ordinary sized family and in order to obtain the best results and the largest yields, it is necessary that every foot of land be brought thoroughly under irrigation. Irrigation farming means farming of the most intensive kind, the producing of crops and feeding them on the farm. The crops should be arranged in such rotation as will permit of a beneficial use of the water at all times, as well as providing the necessary food for any live-stock on the farm. On a full irrigated quarter of land from 50 to 75 acres should be seeded to alfalfa. In feeding this it is also advisable to have something in the nature of silage, such as corn or sunflowers. These crops take the place of summer-fallow by keeping the farm free from weeds, for on an irrigated farm, summer-fallow has no value save as a means of getting rid of weeds. Sufficient grain should be raised to provide feed for the stock and if a cash crop is required, wheat can be raised on land following alfalfa, which helps enormously to increase the yield of grain.

The Home.

Under irrigation it is possible to build up a permanent type of agriculture and one of the first requirements is an attractive and comfortable home. With water available it is possible to raise trees of any of the hardy types. These should be on the north, west and south of the farm. If not around the whole farm, they should at least be placed as a protection to the house, the garden, the barn and the pasture. If not possible to put them around all the pasture, then one small portion of it should be thoroughly protected by means of trees. It is possible to raise fruits, such as strawberries, raspberries, currants, gooseberries and certain varieties of cherries, plums and cross-bred apples. No home is complete without a lawn and by doing a little levelling and sowing of a lawn grass mixture composed of Kentucky Blue Grass and White Dutch Clover an excellent lawn can be obtained.

Summary.

1. Do some levelling on the farm each year with the leveller before seeding and cut off some of the high places, as time and labor permits.
2. Place the ditches so that they will deliver water to all the high places on the farm.
3. Ditches should be from 150 to 200 feet apart and made large with high banks so that large heads of water can be used.
4. Seed part of the farm down to alfalfa, preferably without a nurse crop.
5. Do not over-irrigate, as this causes a rise of the water table and in time may give rise to alkaline conditions.
6. Arrange as far as possible to eliminate surface waste water.
7. Wherever possible do fall irrigation.
8. Plan to instal the border system of irrigation.

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